

Idaho Dairy Nutrient Management – A Pilot Program

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Summary

The land application of livestock waste is an important element of Idaho's surface and groundwater quality concerns. The rapidly expanding dairy industry (ranked 6th nationally in milk production) has recently been targeted as a major contributor to these concerns. The Idaho Department of Agriculture (IDA) is responsible for regulating farm sanitation and waste management on dairies in the state. IDA began the rule making process in 1997 with the final legislative review due in early 1999. The Idaho Legislature did, however, approve the proposed rules as temporary for 1998.

During 1998, IDA has worked closely with the Idaho Natural Resources Conservation Service (NRCS) in the development of a Nutrient Management Standard. IDA and NRCS decided during the development of the standard to test it on several dairy farms. The IDA selected ten dairies throughout the state of various sizes and management styles. Nutrient management plans were prepared by teams of NRCS, IDA, and the University of Idaho Extension Service (U of I) planners. These plans were then presented to the entire group for review and discussion.

No significant modifications were made to the Nutrient Management Standard based on the information provided by the Pilot Program. However, the Pilot Program was excellent validation for the Standard. The format and content of the nutrient management plan presented to the producer and regulatory agency was also modified significantly. Information provided by the Pilot Program also altered planner certification method and criteria.

Background

The Idaho dairy industry has grown rapidly in the last eight years with nearly a 75% increase in milk production. The dairy numbers steadily decrease each year, but the shift to larger dairies keeps the cow numbers increasing every year. Many of the larger new dairies in Idaho are coming from other states such as California and Washington. Although this growth is expected to slow it should continue.

In late 1995, the Idaho Dairy Pollution Prevention Memorandum of Understanding (MOU) was signed which transferred the dairy waste program from Idaho Division of Environmental Quality (DEQ) to IDA. This MOU was initiated by the Idaho Dairyman's Association and was also signed by the Environmental Protection Agency (EPA), DEQ, and IDA. The regulatory enforcement prior to the MOU consisted of approximately 50 inspections annually by DEQ and EPA with fines being the major regulatory tool. IDA currently inspects dairies on the average of three times a year with compliance assistance being the primary regulatory tool. The IDA does have the authority to revoke a facility's permit to ship milk if there is a discharge or a repeat non-compliance issue, which has been a very effective means of insuring compliance.

The initial goal of IDA under the MOU was to control discharge from the containment systems to surface and groundwater. That phase of the program took approximately two years to complete. The next phase of the program is the land application of dairy manure and wastewater. The distribution of dairies in

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Idaho is not consistent with the agricultural land base (Figure 1). The Magic Valley of Idaho has the largest percentage of dairies, yet does not have a large portion of the land base. Much of the alfalfa hay fed on the Magic Valley dairies comes from an area 150 miles northeast. This disparity forced IDA to work with several state and federal agencies last year to modify the existing regulations and drafted new rules specifically dealing with the containment and land application of dairy waste. These rules were approved as temporary rules by the 1998 Idaho Legislature and should be reviewed and adopted during the 1999 Legislative session.

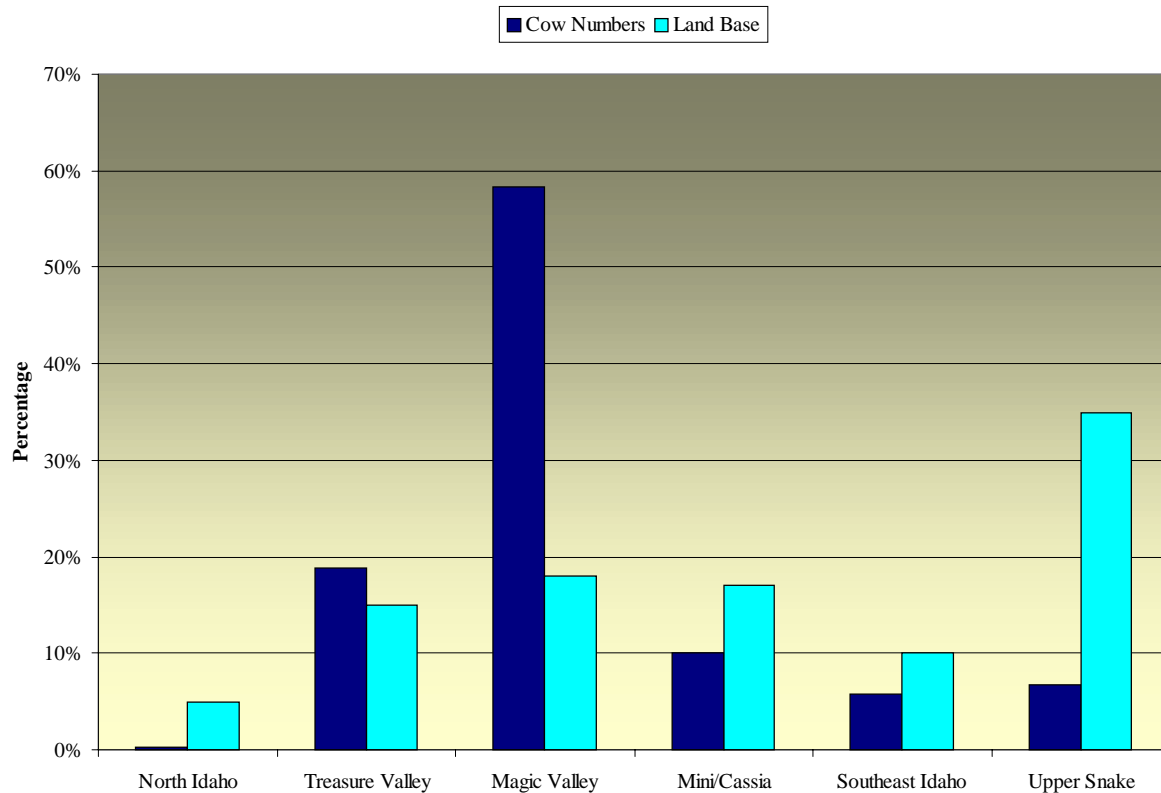


Figure 1. Cow Numbers vs. Agricultural Land Base

IDA has worked extensively with NRCS and U of I during the containment portion of the waste program and continues this relationship through the land application portion. NRCS began the development of a Nutrient Management Standard with input from IDA and U of I, in addition to producer groups and other state and federal agencies. This standard should be finalized by the end of 1998.

IDA will use the Idaho NRCS Nutrient Management Standard as a guideline for the preparation of Nutrient Management Plans (NMP's) for all dairies in Idaho. This will require the preparation of approximately 1000 NMP's within the next two years. These plans will be prepared by certified planners that have attended an education and certification course.

Dairy Pilot Program

The Nutrient Management Standard development group worked on several facilities during the initial stages. One of these facilities was a small dairy located in southwest Idaho. The development group chose to test the Standard on several more facilities in the state. IDA chose ten facilities in the state to use in the Pilot Program and contacted each, seeking their voluntary participation in the program. All of the producers were willing to participate, however, one producer was injured early in the process and a new facility was chosen. The facilities chosen were spread throughout southern Idaho with selection based on herd size. This selection attempted to be consistent with the actual herd size distribution (Figure 2).

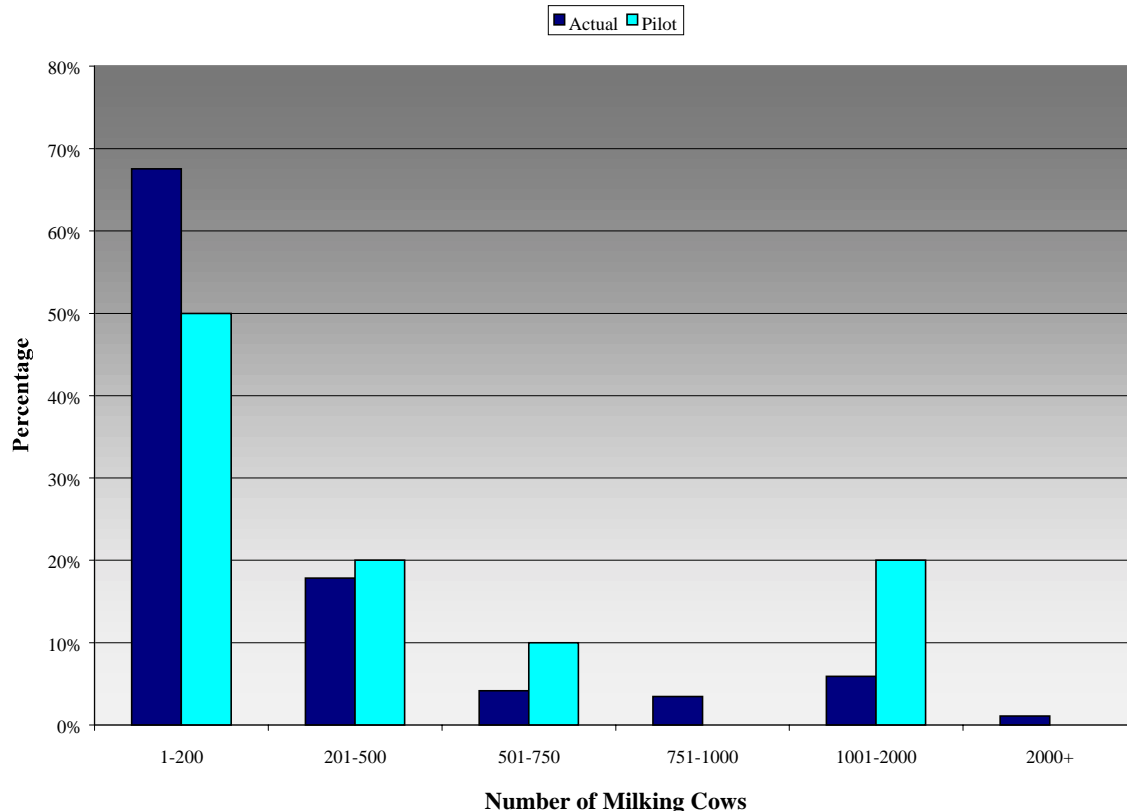


Figure 2. Herd Size Distribution for Dairies in Idaho.

These ten facilities were assigned to three different planning teams. Each team consisted of a lead planner and included one person from each agency. During the site visits and plan preparation, several of the team members were not able to attend. Each facility had at least three planners involved in each plan. The planner teams consisted of IDA engineers and dairy inspectors, NRCS agronomists, engineers, soil conservationists, and water quality specialists, and U of I Dairy Extension Specialists. Several soil scientists from the Agricultural Research Service (ARS) and U of I were also involved with the final planning meeting.

Nutrient Management Standard Overview

Although the Idaho NRCS Nutrient Management Standard has been developed by the dairy industry situation, the Standard does apply to all irrigated and dry cropland. NRCS will use this Standard on all farms, whether the nutrient source is livestock waste or commercial fertilizer. The primary objectives of the Standard are to prevent deep-percolation of nitrogen, limit phosphorous level in runoff from cropland, and prevent deep-percolation of phosphorous in the soil horizon.

The Standard is currently written to allow the use of table values for the nutrient content of manure. Although this method does not receive unanimous support nationally (Lorimor et al., 1997), several regulatory agencies are using it as a method for developing and regulating nutrient management plans. Dairies in Idaho typically do not use a pit manure system. The management option most widely used is an open-lot bedded pack system. There are also a small number of freestall facilities, but manure is typically stacked in a drying area. Although nitrogen is difficult to account for in these systems, the phosphorous appears fairly predictable. The Standard does recommend annual soil testing for nitrogen to determine availability prior to planting, which would also account for varied mineralization rates common in Idaho.

Manure or wastewater application rates are determined by comparing the soil test phosphorous values to the applicable threshold values listed in the Standard. These thresholds are split into two primary categories within the Standard. The first is if the land application field is gravity irrigated (furrows, corrugates, border strip) without tail water return or the field is a significant precipitation runoff concern. If the site falls under these conditions, the soil test phosphorous threshold is 30 ppm in the 0-30cm (0-12") sample, using the [sodium bicarbonate](#) test procedure. If the soil test is less than the threshold, nutrients are applied at the University of Idaho Fertilizer Guide rate. However, soil tests above this threshold require nutrients to be applied at the crop uptake rate for phosphorous.

The second main category of thresholds is if no significant runoff occurs from the field. In this situation there are two subcategories with different thresholds based on depth to resource concern (groundwater, fractured bedrock, extremely permeable layer). If the depth to resource concern is less than 5', the soil test phosphorous limit is 15 ppm in the 46-61cm (18-24") soil sample. If the depth to resource concern is greater than 1.5m (5'), the soil test phosphorous limit is 25 ppm in the 46-61cm (18-24") soil sample.

Irrigation water management is another important element of the nutrient management plan. Proper irrigation management, including frequency, duration, and flowrate are addressed to prevent deep percolation of nitrogen. The soil/crop hydraulic loading is checked to determine acceptability of late fall or early spring irrigations.

Nutrient Management Plans must be prepared by certified planners under the Standard. The certification program for the planners is still being developed, however, it will likely require attending a two day training course and having the first few plans reviewed by a certified planner. Additional courses may be offered for those planners without specific experience related to nutrient management, livestock facilities, or irrigation system evaluation.

Procedure

The lead planner from each team contacted their producers to schedule the initial interview. At least one week prior to the initial interview, someone from the planning team would take soil samples from the facility's land application sites. The soil samplers took composite soil samples from each field. The composite soil sampling was performed using the [University of Idaho soil](#) requirements. A sample was taken from the 0-30cm (0-12") level and a separate sample was taken from the 46-76cm (18-30") level. The upper sample was used to determine residual nitrogen availability, while the lower sample was used to determine the phosphorous level in relation to the threshold.

The producer interview was used to gather information regarding crops, cropland, irrigation practices, dairy waste management system, and manure exporting. A facility site plan and cropland map were prepared with the producer's assistance. Additional soil sampling was also performed on several facilities during the interview. Manure and wastewater samples were taken at several of the facilities to determine nitrate and total nitrogen contents.

The planning team then worked together preparing the nutrient management plan. The initial process in the plan preparation was to determine the nutrient availability, based on livestock production and applicable losses. These values were then used to prepare a nutrient balance for each crop in the rotation. The plan was balanced for an individual year based on nitrogen and on the rotation for phosphorous. The irrigation system was then evaluated to insure a hydraulic balance.

Several of the planning teams prepared full nutrient management plans for presentation at the final planning meeting. Other teams only prepared a presentation highlighting the pertinent information for the facility. The plans were presented during the first day of the meeting, while the second day was used to discuss the Standard.

Results

The common concern with all of the facilities investigated was the irrigation system. Only three of the systems analyzed were being operated within the hydraulic loading of their nutrient management plan. Several of the facilities were gravity irrigated.

References

Lorimor, J.C., K. Kohl, and G. Wells. 1997. Swine liquid manure nutrient concentrations field study results. Presented at 1997 ASAE Annual International Meeting held in Minneapolis, Minnesota.

Midwest

ASAE Standard

NRCS Field Handbook